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Obituary.

PIETRO TACCHINI.

1838—1905.

Professor Pietro Tacchini, until recently Director of the Astronomical Observatory and of the Central Meteorological and Geodynamical Institute in Rome, died at his estate at Spilamberto, near Modena, on March 24th. Although meteorology claimed only a share of the attention of the distinguished Italian man of science, the organization of the Italian Meteorological Service owed much of its efficiency to his efforts. Probably, Professor Tacchini will be remembered best for his researches on the physical constitution of the sun, especially his spectroscopic studies of sunspots and prominences. He did scarcely less for the study of earthquakes, having founded, and long presided over, the Italian Seismological Society. Along with Dr. Billwiller, Professor Tacchini was elected an honorary member of the Royal Meteorological Society on May 18th, 1892.

ROBERT BILLWILLER.

2nd August, 1849—14th August, 1905.

Dr. Robert Billwiller, the eminent Swiss meteorologist, died in the fifty-seventh year of his age. Born at St. Gallen, in Switzerland, he studied first in Zurich, and afterwards in the Universities of Göttingen and Leipzig. At that time his attention was given mainly to astronomy and mathematics, but in 1872 he was appointed to a meteorological assistantship in the Federal Observatory at Zurich, of which Dr. Rudolph Wolf was then Director. In less than ten years Billwiller had worked up the small meteorological department of the Observatory into a Central Meteorological Institute for Switzerland, of which he was appointed Director in 1881. A few years later a wealthy citizen of Winterthur left a legacy of £5000 to the Institute, thereby greatly extending its usefulness.

Altogether, the Swiss system included 118 complete meteorological stations, and 270 additional rainfall stations. Amongst these is the first-order station established on the summit of the Säntis, in 1882, by private initiative, but, with a happier fate than befel its slightly younger sister on Ben Nevis, it was taken over by the Government in 1885. Billwiller's work on mountain and on föhn winds were important contributions to meteorology. He was a man of wide culture, known and honoured far beyond his native land. On May 18th, 1892, he was elected an honorary member of the Royal Meteorological Society.

THE RAINFALL OF THE ELEVEN MONTHS.

Aggregate of Rainfall for January—November, 1905.

Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.
	in.			in.			in.	
London	22·22	96	Bolton	38·42	100	Braemar	33·41	101
Tenterden	26·01	102	Wetherby	22·34	90	Aberdeen	30·25	102
Hartley Wintney	22·67	92	Arncliffe	46·89	86	Cawdor	28·98	108
Hitchin	22·48	99	Hull	19·78	80	Invergarry	49·49	100
Winslow	20·29	83	Newcastle	21·03	83	Bendamph	77·17	100
Westley	21 13	91	Seathwaite	105·91	90	Dunrobin	30·13	107
Brundall	21·81	94	Cardiff, Ely	30·65	80	Killarney	40·99	80
Alderbury	25·00	95	Haverfordwest	37·49	88	Waterford	31·62	90
Winterbourne	29·95	86	Gogerddan	39·59	97	Broadford	28·60	95
Torquay	26·87	85	Llandudno	25·64	91	Carlow	26·87	87
Polapit Tamar	31·31	91	Cargen	32·67	84	Dublin	24·03	95
Bath	21·86	78	Lilliesleaf	25·76	86	Mullingar	29·12	88
Stroud, Upfield	25·24	92	Colmonell	37·63	94	Ballinasloe	26·03	78
Woolstaston	25·40	84	Glasgow	26·24	81	Clifden	57·16	80
Bromsgrove	19·39	86	Inveraray	60·87	110	Crossmolina	41·95	94
Boston	20·56	96	Islay, Eallabus	47·51	113	Seaforde	30·81	88
Hodsock Priory	16·48	73	Mull	50·95	100	Londonderry	33·70	91
Derby	16·80	70	Dundee	20·95	80	Omagh	32·70	96

The rainfall of November was above the average at most stations, but not to a marked degree except in the north-east of Scotland. The result was to raise the aggregate general rainfall from 85, 95 and 85 per cent., respectively, for England and Wales, Scotland and Ireland, at the end of October, to 88·5, 99 and 89 per cent. at the end of November. The regional distribution remained almost unchanged; rather more of Scotland had received an average fall, the only conspicuously dry part being in the neighbourhood of Dundee. The relatively dry part of England still stretched from the Humber to the Severn, but the only part of the British Isles in which less than 75 per cent. of the average of the 11 months' rain had fallen, was a comparatively small patch round Derby.

ROYAL METEOROLOGICAL SOCIETY.

THE opening meeting of this Society for the present session was held on Wednesday evening, November 15th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. Richard Bentley, President, in the chair.

Sir John W. Moore, M.D., communicated an interesting paper on "The Rainstorm of August 24—26, 1905, in Counties Dublin and Wicklow," which in the absence of the author was read by the Secretary. The atmospheric disturbance which caused the torrential rainfall was near the shores of Kerry on the 24th, and the next morning it was near the Scilly Islands. Thence it travelled slowly northward up St. George's Channel, its centre passing near Dublin early on the morning of the 26th. At this time the system suddenly changed its course, crossing the Channel eastward to Wales, and finally passing over central England and out to sea at the mouth of the Humber in a north-easterly direction. It appears that the rainfall on the 25th exceeded three inches at all stations in the Counties Dublin and Wicklow, while it rose above four inches and even five inches at stations near the Dublin and Wicklow mountains. The author is of opinion that this remarkable downpour was brought about by the co-operation of four factors: (1) A chill antecedent to the arrival of the rain-bearing depression; (2) the slow progress of the depression; (3) the fact that the Counties Wicklow and Dublin lay to the westward of the cyclonic centre and so got its north-easterly and northerly winds; and (4) the physical configuration of those counties and their coast line. As the result of this remarkable rainstorm a destructive flood occurred over the low-lying parts of the Bray Urban District near the mouth of the Bray River. At Little Bray the water rose to a height of 4 feet in the streets, flooding houses, destroying domestic animals and fowls, wrecking furniture, and covering floors, yards and gardens with a thick alluvial deposit.

Dr. H. R. Mill said that as a result of discussing heavy cyclonic rains he had found they occurred nine times out of ten on the left of the track of the depression, and this instance was a confirmation of the rule. It was very desirable to have as close a network of rain gauges as possible all over the country, for stations half-a-mile apart or less might define the boundary of a heavy fall and be extremely helpful in the elucidation of such phenomena as the one under discussion.

Dr. R. H. Scott remarked that he had visited the district affected by the rainstorm soon after the disaster and could testify as to the damage done.

Mr. F. Gaster said that the Hon. Rollo Russell, in a paper recently read before the Society, had shown how the mingling of different air currents often produced abnormal falls of rain, and he thought that in the present instance it was the dry cold east wind meeting the

hills and bursting in under the upper moist current from the south-west which caused rapid condensation and the rain to come down through the east surface wind.

Mr. F. J. Brodie said it was remarkable that the neighbourhood of Dublin seemed liable to heavy falls of rain.

Captain M. W. C. Hepworth said that in this part of the world steady rain was usually experienced in front of the trough of depressions, but in parts of the southern hemisphere—on the east coasts of the continents—the weather was usually bright and sunny in front of an approaching depression and the rainfall occurred in rear of it.

Mr. W. Marriott urged the importance of observers seeing that their rain gauges were always kept in good order and were capable of holding at least 5 inches, as such an amount might fall on any day. At Scarborough 9½ inches were measured on August 6th, 1857, but the rainfall actually exceeded that amount as the gauge had overflowed.

Mr. Baldwin Latham, Mr. W. B. Tripp, Mr. J. Hopkinson, and the President also took part in the discussion.

A paper by Dr. W. B. Newton, describing "The Aquameter," was in his absence read by Mr. D. A. Louis. This is a new instrument for measuring the amount of aqueous vapour present in the atmosphere by measuring the reduction of volume produced by the absorption of the water-vapour by phosphoric anhydride.

Dr. W. N. Shaw pointed out that instruments precisely similar in principle had already been tried and found wanting.

Mr. F. Gaster, Mr. D. A. Louis, and the President also took part in the discussion.

The following gentlemen were elected Fellows of the Society:—Capt. G. A. Alcock; Lieut.-Col. J. E. Capper, C.B.; Mr. G. A. Denny; Dr. A. T. Gott; Mr. R. G. F. Grain; Mr. E. Holding; Mr. A. R. Hutson; Dr. G. J. Macaura; Dr. E. M. Modi; Mr. A. E. Moore, B.A.; Capt. A. Simpson; Mr. J. F. Unstead, B.A.; Mr. W. Warren; and Dr. W. G. Willoughby.

Correspondence.

AURORAL DISPLAY OF NOVEMBER 15th.

To the Editor of Symons's Meteorological Magazine.

I SEND you a very feeble representation of "magnetic storm" phenomena as seen here last night, and probably throughout the west generally. I have never seen anything like it. The "show" began after sunset in a cloudless sky; a bright red glow shot through with "streamers," in the west, as though a large fire was burning not far off. This continued for some time. About 9 p.m. the glow

spread in streamers towards the zenith, and beyond it to the east. Then it culminated in a "focus," as I have tried to depict it, due south, about 15° to 20° south of the zenith. At the same time the red glow faded from the west, and became brilliant low down in the east, which was flooded with steady red colour—not "spearing." The moon was up about 30° above the horizon.

The focusing lasted about 20 minutes, then gradually faded. For a considerable time the red band extended from west to east, not in an arch, but continuously; I mean not in a rainbow-like arch, such as I have seen depicted, as northern lights are seen in Arctic regions.

When we first noticed the glow in the west it was so brilliant that I thought the farmsteading must be on fire, and I went up there to give the alarm! This was at 7.45 p.m., and at 8.30 the light was the same; then followed the marvellous vision I have described. The sky to the north was quite clear and still throughout.

What puzzles me is that the "fireworks" went on south of the zenith all the time. Surely magnetic phenomena are usually seen as coming from the north and in the north. These came from the west and extended to the east, south of the zenith, and the east-to-west latitudinal line. G.G.C.

Island of Jura, N.B., 16th November, 1905.

LAST Wednesday evening, (November 15th) there was a faint white aurora borealis from 6.20 to 6.40 p.m. in the N.N.W., with a pink blush to 6.30 p.m.; and a brilliant aurora borealis from 8.45 p.m. to 9.30 p.m.; then a faint white one at 9.40 p.m.; the red colour was in the W. to 9.5 p.m., in N. to N.E. from 9 to 9.15 p.m., and nearly reaching the zenith (with yellow streamers pointing to N.N.W. from 9 to 9.3 p.m.), and in N.N.W. from 9.15 to 9.30 p.m. A N.E. breeze blew all the evening, and the dry and wet bulb thermometers in the screen read 34°·8 and 33°·1 at 9.17 p.m., G. M. T. Low cirrus cloud came slowly from S.E. up to 6 p.m., and radiated to E.S.E. to 8 p.m.; and soft alto-cumulus from N.E. from 7 to 9.20 p.m. Yesterday four spots were visible on the sun through the telescope at 3 p.m.

EDWIN G. GLYDE.

Statsford, Whitchurch, Tavistock, Nov. 17th, 1905.

A VERY bright aurora was seen in this neighbourhood during the evening of November 15th. The phenomenon first became visible at 7.30 p.m. at a point about due north. A narrow arc of a pale yellow colour spanned the northern horizon (the segment of sky beneath the arc being quite black), from which, at times fitful, wavy rays and streamers rose and fell, their colour varying between a pale pink to a blood-red crimson. The aurora towards 8.45 p.m. brightened considerably, and had risen towards the zenith; the sky

at the time was covered with alto-cumulus moving from a northerly point, a succession of bright lunar coronas being visible, in which the predominant colour was green.

At 8.55 p.m. the aurora had developed an irregular formation, the striking feature noticed was the variability in colour, fading at times to a pale subdued pink, brightening up with a peculiar twitching movement to a deep crimson, the interspaces of the blue sky between the alto-cumulus being illuminated a blood-red crimson.

The general appearance was that of the glow from a large conflagration, but the colour was of a much deeper crimson. The phenomenon lasted to 9.30 p.m., when a clearance of cloud from the sky took place, and by 9.35 p.m. all traces were lost.

The last aurora seen in this district previously was on April 14th, 1904, but was not in any way comparable, owing to the absence of streamers and the presence of considerable cloud.

SPENCER C. RUSSELL.

Ashley Road, Epsom, November 18th, 1905.

[The aurora was seen in all parts of the British Isles, and over a considerable part of the continent. At Ghent and Turnhout in Belgium, alarms of fire were raised when the brilliant glow was first observed. It is noteworthy that in Scotland the auroral display appeared to the south of the zenith, while in the more southerly latitudes it appeared in the north. We regret that we cannot reproduce the effective water-colour sketch, illustrating the first of the letters printed above.—ED., *S.M.M.*]

LOW TEMPERATURES IN OCTOBER.

I WAS much interested in the article on Low Temperatures of October in your Magazine of last month.

My record for the 19th was 14°, and for the 20th and 22nd 15°, so I send you a copy for the month. Sixteen nights had minima below 32° and five reached or fell below 20°. No such low temperatures appear in my records so far as I have examined them (to 1883).

ED. B. MARTEN.

Pedmore, near Stourbridge, 22nd November, 1905.

SOME WEATHER PROBLEMS.

THE inquiry suggested by Mr. Alex. B. MacDowall as to a relation between the behaviour of polar ice and the sunspot cycle is one which might well be carried out by observers stationed in places suitable for recording the nature and extent of local ice floes, and no doubt valuable stores of informatiom could be found in the old log books of the Newfoundland sealing fleet. In March they set out for the ice where the seals are. The reputation of a "sealing king" depends upon his knowledge as to the whereabouts of the ice, which varies

greatly from year to year; but he seldom fails to find it, being guided by experience and his own interests.

As I was in Newfoundland in 1895 I can submit the fact that in the Spring of that year for over two months communication with the outside world was practically cut off owing to Arctic ice packing the harbours. The late Professor G. Holloway, who had observed in that country for twenty-six years, informed me that it was a maximum ice floe period; it will be seen that the date suggests relation to the sunspot maximum.

I am inclined to think that Sir William MacGregor, the present Governor of Newfoundland, will take an interest in this subject and give to science the benefit. We have not forgotten his interesting contribution to the Magazine of last September.

FLEETWOOD C. VARLEY.

Park Villa, Campden, Glos., November 19th, 1905.

[The movements of Arctic ice are studied and charted by the Danish Meteorological Institute in accordance with an international arrangement, and further data from Newfoundland would be useful and welcome. Many years' data will be required to prove any relationship to other periodic phenomena.—ED. *S.M.M.*]

CURIOUS EFFECT OF LIGHTNING.

IT was my intention to give you the following particulars of a somewhat peculiar effect of lightning a few days after the event; but circumstances have prevented me from doing so until now.

It was as I think on 27th July last that a severe thunderstorm took place over North London, and extended, as I read in various papers, as far south as Croydon, but we had nothing here beyond sultry heavy atmosphere during the day. At about 4.30 p.m. I heard distant thunder occasionally, no doubt over Croydon, 8 or 9 miles distant, but nothing nearer, when a sharp report like a magnified rifle crack startled my daughters and myself as we sat in our room facing west, and at the same time a vivid flash of jagged lightning across the windows caused me to go outside shortly after to see and enquire whether anything in my grounds had been struck. This house and the one next it are about halfway down the slope of the east side of the hills forming the Harestone Valley, and had any of our chimneys or the trees near by been struck I should have been in no way surprised; but the electric current chose a low terra-cotta chimney nestled down among trees half way down my neighbour's garden, punched a round hole of about three inches diameter without splitting the material at all, satisfying itself by breaking out several bricks of the bedwork of the pot, and throwing them through the stoke-hole roof. Careful search has not yielded any find of a so-called "bolt" of any sort. I should add that no fire was alight, nor had there been one to cause any heated air, which is said to attract

the current down a chimney. The trees adjacent are much higher than the greenhouse or its little chimney, but none of them were touched. The isolated stroke of lightning and its effect appear to me sufficiently unusual to be worth notice.

Any comments you make like to make at your leisure will be read with interest.

HENRY HAES.

Bradenhurst, Caterham Valley, Surrey, 3rd Nov., 1905.

[We should be glad to hear our readers' views on this matter.
ED. *S.M.M.*]

LONG RANGE WEATHER FORECASTING.

THE number of weather-prophets in the United States who issue forecasts for a long period a-head, based on astronomical or other "laws" of their own discovery, induced Professor Willis L. Moore, Chief of the U.S. Weather Bureau, to publish a criticism of some of their claims about a year ago. We have kept the papers issued at that time before us for some months in the hope of dealing somewhat fully with the matter; but the season of endeavouring to clear up arrears of book-notices, so as to start afresh with a new volume, has come, and very reluctantly we must content ourselves with a brief summary. Professor E. B. Garriott deals with the subject in Bulletin 35 of the U.S. Department of Agriculture, Weather Bureau. Professor Moore expresses his views unreservedly in the Letter of Transmittal prefatory to the pamphlet:—

"The success of the United States Weather Bureau in making conservative forecasts of the weather two or three days in advance has created the hope in the minds of the people that it may be possible to foresee the character of the weather for the coming month or season. All scientific men know that at present it is impossible to gratify this wish, and the Government experts so inform all those who make inquiry. But the mistaken investigator of little knowledge, the pseudo-scientist and the astrologer, see their opportunity and at once step into the breach and sell spurious long-range forecasts to a public rendered credulous by the success of the Government scientists. The abuse of the public confidence has become so great that I have thought it justifiable to present to the reader indisputable evidence of the injurious character of monthly or seasonal forecasts."

Professor Moore does not of course question the possibility of scientific research ultimately leading to a safe basis for long-range forecasts, but merely lays stress on the present limitations. An interesting criticism by Professor C. M. Woodward, of Washington University, demolishing a system of "planetary meteorology," is reprinted, as, although published in 1875, the fallacies then refuted are, it is stated, still being exploited in St. Louis. Professor Garriott

sums up his study of the whole question in the following admirable conclusions :—

1.—That systems of long-range weather forecasting that depend upon planetary meteorology; moon phases, cycles, positions, or movements; stellar influences, or star divinations; indications afforded by observations of animals, birds and plants, and estimates based upon days, months, seasons and years have no legitimate bases.

2.—That meteorologists have made exhaustive examinations and comparisons for the purpose of associating the weather with the various phases and positions of the Moon, in an earnest endeavour to make advances in the science along the line of practical forecasting, and have found that while the Moon, and perhaps the planets, exert some influence upon atmospheric tides, the influence is too slight and obscure to justify a consideration of lunar and planetary effects in the actual work of weather forecasting.

3.—That the stars have no appreciable influence upon the weather.

4.—That animals, birds and plants show by their condition the character of past weather, and by their actions the influence of present weather and the character of weather changes that may occur within a few hours.

5.—That the weather of days, months, seasons and years affords no indications of future weather further than showing present abnormal conditions that the future may adjust.

6.—That six and seven day weather periods are too ill-defined and irregular to be applicable to the actual work of forecasting.

7.—That advances in the period and accuracy of weather forecasts depend upon a more exact study and understanding of atmospheric pressure over great areas and a determination of the influences, probably solar, that are responsible for normal and abnormal distributions of atmospheric pressure over the Earth's surface.

8.—That meteorologists are not antagonistic to honest, well-directed efforts to solve the problem of long-range forecasting; that, on the contrary, they encourage all work in this field and condemn only those who, for notoriety or profit or through misdirected zeal and unwarranted assumptions, bring the science of meteorology into disrepute.

9.—That meteorologists appreciate the importance to the world at large of advances in the period of forecasting and are inclined to believe that the twentieth century will mark the beginning of another period in meteorological science.

THE RELATION BETWEEN THE CIRCULATION OF THE ATLANTIC AND WEATHER.

DR. W. MEINARDUS publishes in the *Meteorologische Zeitschrift* for September the results of an investigation into the relation between the circulation of the water in the North Atlantic Ocean and the weather. The variation of atmospheric pressure between pairs of stations on opposite sides of the ocean was adopted for the purpose of comparing the weather conditions. It became apparent that the air over the whole North Atlantic and the surrounding coasts behaved as one system, in relation to the Icelandic centre of low

pressure, the gradients sometimes steepening and sometimes becoming less marked. When the gradients steepened it was found that the temperature of the Gulf-stream water simultaneously increased also, while when the gradients diminished the temperature of the water simultaneously fell; the pressure difference often being established for some months before the temperature difference appeared. An increase of pressure gradient corresponds also to an increased amount of ice carried southward by the Labrador current, and a diminished gradient to a reduced amount of ice. The latter relationship allows this simple rule for predicting the character of the ice off Newfoundland for the coming summer :—

The amount of ice to be met with off Newfoundland in any particular summer is determined by the atmospheric gradients in the preceding months November to January between the south of Greenland and the mouth of the St. Lawrence, and the amount of ice is directly in proportion to the magnitude of this gradient.

It has been observed also that in most cases years in which much ice is found off Newfoundland are associated with a warm Spring (February to April) in central Europe, and years when there is little ice with a cold Spring. W. Brennecke's investigation of the East Greenland current showed that the position of the limit of ice in summer in the sea east of Greenland was dependent on the magnitude of the gradient of atmospheric pressure between Greenland and northern Scandinavia in the months March to May.

Throwing the whole into a simple form, and remembering that a weak circulation corresponds to a low gradient and a strong circulation to a high gradient, Dr. Meinardus draws these remarkable conclusions; A and B being groups of conditions that are associated together.

A.—1. Weak Atlantic circulation (August—February).
2. Low water temperature on the coasts of Europe (November—April).
3. Low air temperature in Central Europe from February to April.
4. Little ice off Newfoundland in Spring.
5. Much ice off Iceland in Spring.
6. Bad harvests of wheat and rye in western Europe and northern Germany.

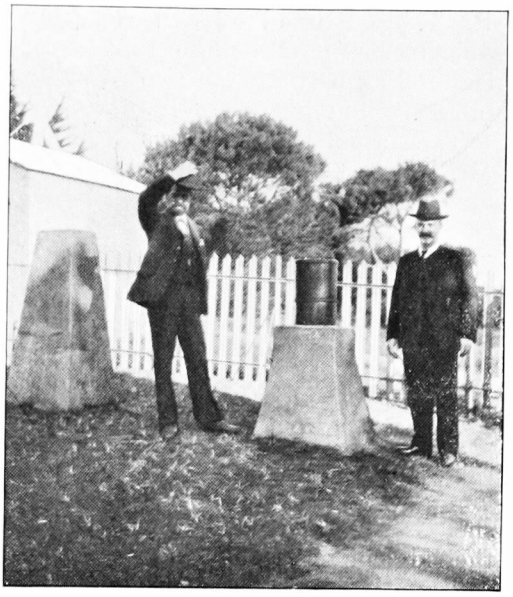
B.—1. Strong Atlantic circulation (August—February).
2. High water temperature on the coasts of Europe (November—April).
3. High air temperature in Central Europe from February to April.
4. Much ice off Newfoundland in Spring.
5. Little ice off Iceland in Spring.
6. Good harvests of wheat and rye in western Europe and northern Germany.

The curves which illustrate the paper bear out this relationship in the most striking way.

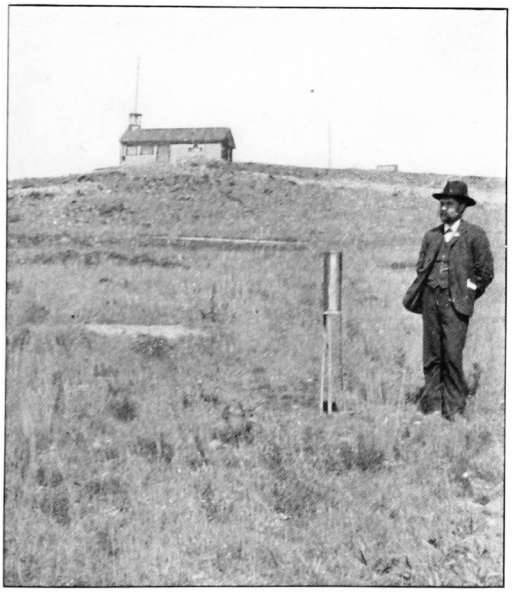
THE BRITISH ASSOCIATION IN SOUTH AFRICA.

[THIRD ARTICLE.]

WHILE in South Africa we took every opportunity of photographing scenes and objects of meteorological interest, but we had not calculated on the number of films which the attractiveness of the novel sights tempted us to expose, and so we had not a sufficient number of air-tight tin cases in which to bring home the exposed films; hence a certain proportion was lost on account of the deterioration brought about by the heat and dampness of the Red Sea on the homeward voyage. Of the 220 good negatives that came safely through the ordeal, we select four for re-production here. The first shows the standard rain-gauge of the Royal Observatory at Cape Town, the diameter of which is about $11\frac{1}{4}$ inches, so as to give an area just double that of an 8-inch gauge, so that when the rain is measured in a glass for an 8-inch gauge the resulting figure divided by 2 gives the actual fall. No other gauge in Cape Colony, so far as we know, has this great diameter, but all are erected as shown on stone pillars, so that the receiving surface is 4 feet above the ground. In consequence of this, from 3 to 4 per cent. should be added to the readings of South African rain-gauges before comparing them with the figures of rainfall in Great Britain. Mr. J. Power, of



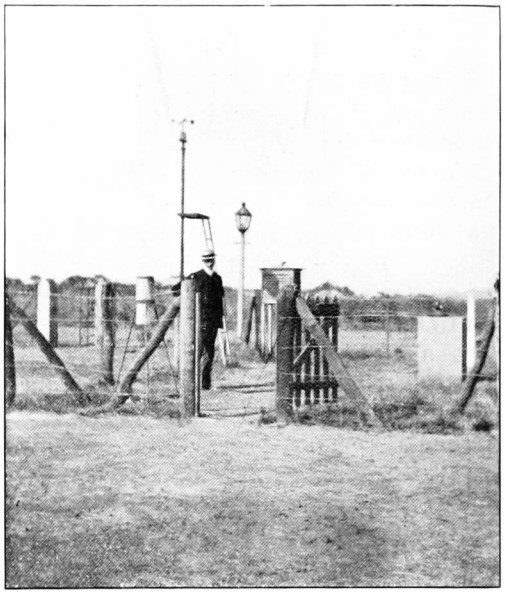
THE STANDARD RAIN-GAUGE AT THE ROYAL OBSERVATORY, CAPETOWN.



METEOROLOGICAL OBSERVATORY, JOHANNESBURG.

the Cape Observatory, is standing with the gauge on his right hand, and Mr. R. T. A. Innes, of the Johannesburg Observatory, is standing between the two pillars.

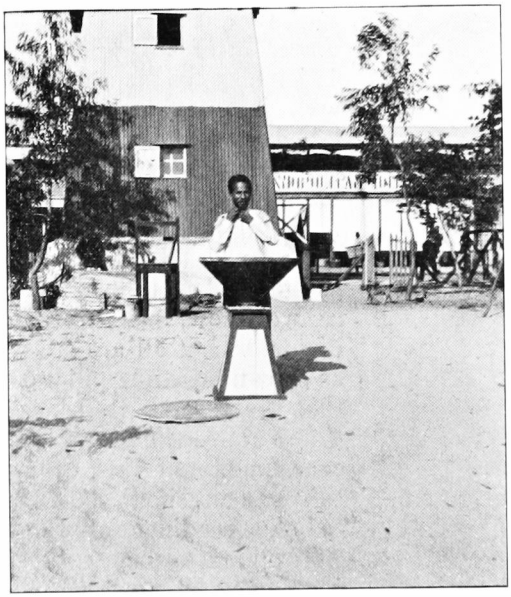
The second picture shows Mr. Innes standing beside a 5-inch rain-gauge, set up in an iron stand to a height of 4 feet according to the system in use in the Transvaal. The Johannesburg Meteorological Observatory (see p. 174) is seen on the hill in the background, the tall mast on the building carries the Dines' anemometer, and the large louvred shed is seen farther along the ridge on the right.



THE METEOROLOGICAL STATION, SALISBURY, RHODESIA.

The third illustration shows the meteorological station at the Hospital in Salisbury, Rhodesia. The 8-inch rain-gauge, mounted on iron legs, the Robinson anemometer, Stevenson screen, sunshine-recorder, and black-bulb thermometer are all to be seen.

Finally, we give a view of the great rain-gauge at Beira in Portuguese East Africa. Time was pressing, and the native attendant did not speak English, so that we have no particulars of this instrument to impart.



RAIN-GAUGE AT BEIRA, PORTUGUESE EAST AFRICA.

THE BULAWAYO METEOROLOGICAL OBSERVATORY.

By Rev. E. Goetz, S.J.

Meteorological observations were started in Bulawayo in 1897, by the Jesuit Fathers, at St. George's School, with the usual set of meteorological instruments. In 1903 they built a regular observatory, and got registering instruments, which have been recording since January, 1904. These are (1) a Richard Anemometer, recording every kilometer of wind, and directly the four directions electrically. The four intermediate directions are recorded by the simultaneous marking of the two component directions. (2) Richard Barograph, Thermograph, and Hair Hygrometer. (3) A Marvin Sunshine Recorder. (4) A Recording Rain Gauge, constructed at the Observatory, after the U.S. Weather Bureau pattern.

The rain gauge is of the usual bucket pattern, each bucket-full representing one-hundreth of an inch of rain. As the bucket falls over when full it touches a contact, and this contact is recorded. The recorder has been constructed in the following way: the minute hand of an ordinary clockwork has been replaced by a crank, which drives a cylinder revolving round a horizontal axis, and one end of the axis has been turned into a screw, of 2·5 mm. thread. The crank is fixed on the pin which bears the minute hand, but enters loosely into a piece of metal at right angles to the axis of the cylinder. The cylinder is thus revolved, and at the same time brought at each revolution 2·5 mm. nearer the clockwork; a fountain pen connected with the armature of a magnet rests on the cylinder, and draws a continuous line. When the bucket in the rain gauge is full and tumbles over, making a contact, the contact draws the pen momentarily to one side, and thus makes a small mark on the continuous line drawn on the cylinder. The cylinder has a circumference of 33 cm., giving thus a run of a little over 5 mm. per minute. Ten to twelve marks are quite distinct in this space, so that rates of 6 to 7 inches an hour are distinctly recorded. Besides the meteorological instruments there is a complete set of magnetic instruments of the Kew pattern; a magnetometer by Nalder Bros., and a Dover dip circle.

The recording instruments are made by Richard, (Paris); the barometer (inch measure) and Fahrenheit thermometers, by Negretti and Zambra; the barometer (mm. measure) and Centigrade thermometer, by Tonnelet (Paris).

Judging from the records of the last eighteen months, the observations seem to be likely to prove of a certain value on account of the great regularity of the weather. The wind, pressure, temperature, and hygrometer records show a remarkable correlation.

REPORT OF THE BRITISH ASSOCIATION KITE COMMITTEE.

Investigation of the Upper Atmosphere by Means of Kites in co-operation with a Committee of the Royal Meteorological Society.—Fourth Report of the Committee, consisting of DR. W. N. SHAW (*Chairman*), MR. W. H. DINES (*Secretary*), MR. D. ARCHIBALD, MR. C. VERNON BOYS, DR. A. BUCHAN, DR. R. T. GLAZEBROOK, DR. H. R. MILL, PROFESSOR A. SCHUSTER *and* DR. W. WATSON.

The following is the substance of the Report presented to the British Association in Johannesburg.

Apparatus for testing and calibrating the meteorographs has been made by Mr. J. J. Hicks, and consists of an ordinary air-pump with a large receiver. Inside the receiver there is a coil of metal tube, through which warm water or a freezing-mixture can be circulated; there is also a small electric fan to ensure uniformity of temperature throughout the enclosed space. The meteorograph is placed inside, and the pressure and temperature altered in any desired way. A record is kept, and is compared with the trace obtained from the meteorograph when it is taken out of the receiver. Inasmuch as the thermal capacity of the heavy glass receiver and metal plate is very considerable, the process of warming or cooling the interior is a slow one. A few tests have been made for ascertaining the extent to which the temperature correction of the barograph is dependent on the pressure, but generally a quicker plan is employed for testing the thermograph. The instrument is placed in a thin metal case with a water-jacket. The lid is also jacketed, and by circulating a liquid through the jacket, and enclosing the whole arrangement in felt or other non-conducting material, there is no difficulty about rapidly bringing the meteorograph to any desired temperature.

The pen of the hygrograph moves in accordance with the change of length of 4 feet of human hair. The approximate scale is a change of length of ·45 inch from absolute dryness to complete saturation, but a more exact determination is now being made by hanging a small weight at the end of 4 feet of hair in the open, and taking simultaneous readings of its length and of a wet and dry bulb thermometer.

Continuance of Observations.

The apparatus used on board the "Seahorse" was fitted up at Oxshott at the end of September, 1904, and since that date forty-five ascents, giving good records, with an average height of about 4,400 feet, have been made. These include most of the days appointed by the President of the International Aëronautical Commission. The observations for those days are regularly reported to Professor Hergesell, and will appear in the publications of the International Committee.

Kite Ascents at Oxshott.

1904.		Length of Wire.	Maximum Height.	Temperature Decrease (Degrees Fahr.)	Number of Kites
Sept.	30	8,000	5,000	*10	1
Oct.	3	6,200	3,500	14	1
,,	5	8,240	4,650	*10	1
,,	6	7,300	4,250	17	1
,,	7	8,000	5,400	16	1
,,	8	4,800	3,250	12	1
Nov.	3	6,100	3,250	4	1
,,	8	4,560	3,000	13	1
,,	30	7,180	3,800	12	1
Dec.	1	6,700	3,200	*7	1
,,	5	6,200	3,850	16	1
,,	13	6,400	3,280	9	1
,,	16	3,600	2,850	9	1
,,	19	6,100	3,250	13	1
,,	29	9,560	4,400	10	1
1905.					
Jan.	4	8,000	5,500	17	1
,,	5	10,500	5,800	17	1
,,	28	6,300	3,600	*—6	1
,,	30	5,500	2,700	15	1
Feb.	3	6,000	3,350	11	1
,,	4	3,100	2,600	8	1
,,	10	11,600	7,900	*15	2
,,	17	7,300	4,250	16	1
,,	18	8,000	5,200	*5	1
Mar.	2	6,500	4,650	14	1
,,	3	4,200	3,170	11	1
,,	6	5,400	4,600	12	1
,,	8	6,000	4,100	13	1
,,	17	5,100	3,300	12	1
,,	25	4,500	2,880	10	1
,,	28	7,000	4,400	15	1
,,	29	8,000	5,600	17	2
,,	31	10,000	6,500	26	2
Apr.	1	8,000	4,900	13	2
,,	4	9,000	5,470	19	2
,,	7	9,000	6,200	15	2
,,	13	8,000	5,050	21	1
,,	17	5,700	4,000	6	1
,,	24	5,100	3,800	11	1
,,	25	12,000	7,600	20	2
,,	27	10,000	6,000	12	2
,,	28	5,000	3,500	10	1
May	5	10,300	7,600	15	2
,,	8	6,700	4,300	22	2
June	1	12,000	7,300	31	2

* Indicates a temperature inversion.

Comparatively little trouble has been experienced during the winter with any part of the apparatus. The steam engine that was bought last year did not prove satisfactory while in use on the "Seahorse," but has been altered. The wire that was wound on the reel at Crinan is still in use without a join,

although, of course, pieces have occasionally been lost from the end. The chief requirement is a satisfactory kite, which will combine the three characteristics of flying at a good angle, of being stable and not liable to damage in any wind, and of never exerting an excessive pull. Perhaps such a kite can never be obtained, but there are such an infinite number of ways in which the various types of kite now in use may be altered—and the most trifling alterations of detail are sometimes capable of producing very great effects—that extensive experimental work can hardly fail to develop a kite better than any at present available.

Observations are being continued at Oxshott, but it is not proposed to make any attempt to obtain a vessel for work elsewhere this summer.

The Committee was re-appointed without a grant.

REVIEWS.

Solar Physics Committee. Mean Annual Variations of Barometric Pressure and Rainfall in certain regions, being a study of the mean annual pressure variations for a large number of areas scattered over the Earth's surface in relation to the principal types of mean annual rainfall variations in those areas, made at the Solar Physics Observatory, South Kensington, under the direction of SIR NORMAN LOCKYER. London. Printed for H. M. Stationery Office. 1905. Size 12 × 10. Pp. iv. + 16 and 17 plates. Price 1s. 6d.

THIS forms a convenient collection of types of rainfall distribution throughout the year in a great many places situated all over the world. The source of the data is duly acknowledged, but dealing with so wide a geographical range it was, of course, impossible to secure perfect comparability. The period for which the averages are made is different, and in some cases is not known. In most instances the curve for one typical station is taken as representative of a region; but in other cases the mean of groups of stations is used. Monthly rainfall varies so much that we should place no confidence in means for any one station being representative of the normal incidence of rainfall at that station, unless the period were at least 20 years, and to be in any way satisfactory we would prefer 35 years. When the means of several stations in a region are averaged, the monthly curve becomes much more trustworthy; but we confess that we should feel many qualifications to be necessary in drawing any generalization from the curves as given.

Anleitung zur Anstellung und Berechnung meteorologischer Beobachtungen. [Introduction to the establishment and calculation of meteorological observations.] Berlin: S. Asher & Co. 1904, 1905. Size 11 × 8. Pp. (Pt. I.) 66, (Pt. II.) 50. Plates. Price 2m. each part.

THESE instructions are set forth by the Royal Prussian Meteorological Institute for the use of observers in northern Germany. Part I. deals with second and third order stations, and Part II. with first

order stations. The minuteness of the instructions is noteworthy; extending even to a specimen form of recipe for painting the thermometer screen.

Conseil Permanent International pour l'Exploration de la Mer. General Report on the work of the period, July, 1902—July, 1904. With 10 Appendcies. Copenhagen: 1905. Size $11 \times 2\frac{1}{2}$. Pp. 452. Plates.

North Sea Fisheries Investigation Committee. Report on Fishery and Hydrographical Investigations in the North Sea and adjacent waters, conducted for the Fishery Board for Scotland . . . by D'ARCY WENTWORTH THOMPSON, C.B. 1902–1903. London: Printed for H. M. Stationery Office, 1905. [Cd. 2612.] Size $14\frac{1}{2} \times 11$. Pp. viii. + 618. Plates. Price 8s. 9d.

International Fishery Investigations. First Report on Fishery and Hydrographical Investigations in the North Sea and adjacent waters (Southern Area). Conducted for His Majesty's Government by the Marine Biological Association of the United Kingdom. 1902-1903. London: Printed for H. M. Stationery Office, 1905. [Cd. 2670.] Size $14\frac{1}{2} \times 11$. Pp. x. + 378. Plates. Price 8s. 9d.

THESE are merely a selection from the great amount of published data accumulated in the course of the work of the International Council for the Study of the Sea. We notice them because, although the benefits likely to result to meteorology are of the nature of bye-products in the improvement of the fisheries, they are certain to be important. The summary of Dr. Meinardus's work on the influence of the ocean on weather, on another page, will show in what direction the results may be looked for. In the General Report there are two valuable memoirs dealing with the conditions of the North Atlantic and their influence on climate, by Professor Pettersson and Mr. Knudsen. In the Fishery Board Report there is a full translation of a valuable paper by Drs. Sandström and Helland-Hansen on the mathematical investigation of ocean currents, which deserves a wider circulation than a blue-book is likely to afford. A great part of both the Scottish and the English volumes is devoted to the physical study of the northern North Sea and the English Channel, and these are copiously illustrated by maps. The work has been done by Mr. A. J. Robertson at Dundee, and Mr. D. J. Matthews at Plymouth.

Resultats du Voyage du S. Y. Belgica. Météorologie, Rapport sur les observations météorologiques horaires [Report on hourly meteorological observations] par HENRYK ARÇTOWSKI. Anvers: 1904. Size, 13×11. Pp. 52 + 150 + 23 plates.

M. ARÇTOWSKI, the enthusiastic meteorologist of the Belgian Antarctic Expedition, presents in this volume his complete report on

the hourly observations made during the first Antarctic winter ever endured by human beings. The *Belgica* was frozen in an icefloe, which during more than a year drifted to and fro between 69° 38′ and 71° 36′ S. latitude and 80° 30′ and 96° 40′ W. longitude. The climate was that of the frozen sea to the north of any Antarctic land that may lie between those meridians, and that land does lie at no very great distance to the south the depths of the sea show quite clearly. The observations were made for the most part by M. Arçtowski himself, and always under his immediate supervision. We consider that the discussions gain immeasurably in value from this fact. When a stranger attempts to deal with a mass of figures obtained by others in conditions of which he knows nothing, he is apt to draw wrong conclusions as to the degree of trustworthiness of the observations; while, on the other hand, an observer without the knowledge of a trained meteorologist is apt to miss opportunities or to fail to recognise defects in instruments or methods of work. The *Belgica's* records were made and discussed by a man fully alive to their importance, and singularly competent to undertake both tasks. The hourly readings are printed in full—and how we envy M. Arçtowski the splendid breadth of his 9½in. page!—and the traces of the Richard barograph, thermograph and hygrograph are reproduced exactly as they were taken from the instruments, the action of which seems to have been remarkably good in the trying circumstances.

The mean and extreme monthly temperatures have frequently been quoted as given in the preliminary notices. They are now given in their final form, the means being those of the whole number of hourly readings made in the month, and the extremes the absolutely highest and lowest recorded for any hour in the month. The mean barometric pressure for the year was 29·339 in., the highest reading 30·398 in., and the lowest 28·020 in.

Temperatures in ca. 70° *S.*, 1898-99.

	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Year
Mean °F.	16·0	10·7	20·2	4·1	—10·7	11·6	—1·5	17·9	19·6	27·8	29·8	30·0	14·8
Max. ,,	31·1	31·1	33·4	32·0	30·0	32·5	33·6	33·4	33·8	36·5	35·2	34·0	36·5
Min. ,,	—4·5	—15·7	—13·4	—24·2	—34·8	21·6	—45·6	—15·3	—6·5	5·4	16·9	14·4	—45·6

The average daily range was 13·6 Fahrenheit degrees, and the greatest range in any one day (21st July, 1898, a month after midwinter) was 49°·3.

Jelinek's Anleitung zur Ausführung meteorologischer Beobachtungen. [Jelinek's Introduction to Meteorological Observing]. Wien: 1905. Size, 10 × 7. Pp. 124.

THIS is Part I. of the fifth revised edition of the official Austrian handbook for meteorological observers. It is so thoroughly brought up to date as to contain a section dealing with the method of proceeding on finding an unmanned balloon which has fallen with a meteorograph attached.

METEOROLOGICAL NEWS AND NOTES.

THE SYMONS GOLD MEDAL of the Royal Meteorological Society, established in memory of the founder of British Rainfall, has been awarded to Lieutenant-General Richard Strachey, G.C.S.I., for many years Chairman of the Meteorological Council, in recognition of the services he has rendered to the science of Meteorology. The two previous recipients of this medal have been Dr. A. Buchan and Dr. Julius Hann.

NOCTURNAL RADIATION as influenced by water vapour is the subject of a paper by Mr. J. R. Sutton, of Kimberley, in the *Proceedings* of the Royal Dublin Society for August last. He concludes that the fall of temperature at night becomes less rapid as the relative humidity increases, but that the absolute humidity of the air has no influence at all on radiation.

HEAVY RAINS IN THE RHINE DISTRICT on June 17th, 1904, gave Dr. P. Polis, of Aix-la-Chapelle, an opportunity of constructing a detailed rainfall map of some 20,000 square miles of country, making use for this purpose of the observations from 636 stations. Maps of a single day's rainfall constructed on this principle are familiar to readers of "British Rainfall," but Dr. Polis has the advantage of presenting his map on a large scale, and in all the glory of colour-printing, in the pages of *Petermanns Mitteilungen*, for September last. The greatest fall in 24 hours at any station during the storm was 3·20 in., and the total area with a rainfall greater than 2·75 in., was 152 square miles, so that as regards area affected by very heavy rain, it was not very remarkable judged from the standpoint of rain storms in the United Kingdom. The rain was heaviest in patches, fairly regularly placed in three parallel lines, a formation typical of thunderstorms. A second map shows the lines along which the first thunder of the various thunderstorms which brought the rain was heard simultaneously.

THE HIGHEST KITE ASCENT yet made for meteorological purposes was accomplished at the aeronautical observatory at Lindenberg, on 25th November, 1905, according to our contemporary *Das Wetter*. Records were secured at an elevation of 21,096 feet by means of a team of six kites, and a total length of wire paid out of 47,573 feet, or almost exactly nine miles. The pressure at the highest point was 12·99 in., and the temperature —13°·0 F., that on the ground being 40°·8 F. This ascent exceeds by 1000 feet the highest previously obtained, by M. Teisserenc de Bort, on a Danish gunboat, in the Baltic; but higher flights have frequently been made by free balloons.

THE LOWEST AIR TEMPERATURE yet observed appears to be that recorded in a free balloon ascent from St. Louis, in December, 1904, when —122°·1 F. was found; but this was practically equalled at Vienna, on 2nd March, 1905, when —121°·7 F. (154° of frost) was registered at a height of 31,880 feet. At greater heights, up to 37,300 feet, the temperature though more than 100° below zero, was not quite so low as that quoted.

RAINFALL AND TEMPERATURE, NOVEMBER, 1905.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in *British Rainfall* to which each station belongs.]	RAINFALL. Total Fall.	Diff. from average, 1870-99.	Greatest in 24 hours. Depth	Greatest in 24 hours. Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date.	Min. Deg.	Min. Date	No. of Nights below 32°. Shade	Grass
		inches	inches.	in.								
I.	London (Camden Square) ...	3·08	+ ·63	·46	2	19	55·2	26	24·2	21	7	19
II.	Tenterden ...	4·24	+ 1·02	·71	11	22	56·0	8	28·0	22	7	14
,,	Hartley Wintney ...	3·19	+ ·16	·66	10	20	53·0	3, 23	23·0	22	14	17
III.	Hitchin ...	2·40	— ·16	·44	26	15	53·0	26	26·0	20	11	...
,,	Winslow (Addington) ...	3·21	+ ·58	·75	26	15	53·0	2, 3*a*	22·0	21	13	19
IV.	Bury St. Edmunds (Westley)	2·16	— ·34	·35	26	20	55·0	1	25·0	21	...	...
,,	Brundall ...	1·95	— ·76	·55	11	19	54·2	26	23·6	21	9	15
V.	Alderbury ...	3·56	+ ·37	·82	10	17	55·0	4	18·0	20	14	...
,,	Winterbourne Steepleton ...	6·70	+ 1·88	1·21	10	21	54·3	4	18·3	21	13	21
,,	Torquay (Cary Green) ...	5·39	+ 1·68	·88	12	16	55·7	4	25·8	21	3	19
,,	Polapit Tamar [Launceston]	5·72	+ 1·43	1·08	1	21	53·6	4	...	...	..	15
,,	Bath ...	3·08	+ ·02	·59	10, 12	17	55·2	25	24·6	17	13	24
VI.	Stroud (Upfield) ...	3·77	+ ·78	·71	10	21	53·0	2	25·0	19	...	..
,,	Church Stretton (Woolstaston)	3·37	+ ·19	·63	10	20	50·5	8	22·0	19	18	...
,,	Bromsgrove (Stoke Reformatory)	2·29	+ ·02	·68	10	16	49·0	2	18·0	19	18	...
VII.	Boston ...	2·45	+ ·31	·57	26	14	50·0	12	26·0	18	10	...
,,	Worksop (Hodsock Priory).	2·56	+ ·46	·63	10	17	52·0	6	23·5	20	7	22
,,	Derby (Midland Railway)...	2·50	+ ·22	·42	10	21	53·0	2	23·0	20	8	...
VIII.	Bolton (The Park) ...	5·12	+ 1·21	·67	22	23	50·8	11	25·7	18	7	15
IX.	Wetherby (Ribston Hall) ...	4·24	+ 2·01	·83	1	19	...	...	...	...	...	..
,,	Arncliffe Vicarage ...	7·39	+ 1·39	·99	26	25	...	...	...	...	...	...
,,	Hull (Pearson Park) ...	2·95	+ ·50	·37	11, 28	22	52·0	2, 26	23·0	18, 19	7	18
X.	Newcastle (Town Moor) ...	4·50	+ 1·85	·75	1	26	...	...	...	...	...	...
,,	Borrowdale (Seathwaite) ...	13·92	+ ·01	3·20	22	18	51·3	22	20·4	19	9	...
XI.	Cardiff (Ely) ...	4·22	— ·04	·83	10	22	...	...	...	...	..	...
,,	Haverfordwest (High St.)...	6·93	+ 1·52	1·30	10	23	52·4	10, 11	25·0	18	7	21
,,	Aberystwyth (Gogerddan)...	4·07	— ·61	·60	10, 22	15	65·0	2	21·0	16, 17	10	...
,,	Llandudno ...	3·86	+ ·48	·94	27	20	56·0	23	27·2	19	3	...
XII.	Cargen [Dumfries] ...	4·75	+ ·25	·80	10	16	52·0	3, 23	18·0	19	9	...
,,	Lilliesleaf (Riddell) ...	3·38	+ ·09	·77	1	21	51·0	20	17·0	18	14	15
XIII.	Edinburgh (Royal Observy.)	3·36	...	·62	3	20	53·2	23	24·0	19	3	11
XIV.	Colmonell ...	6·68	+ 1·81	1·58	10	16	52·0	11, 22	18·0	18	10	...
XV.	Tighnabruaich ...	6·78	+ ·57	1·10	25	18	46·0	1, 3	25·0	17	8	10
,,	Mull (Quinish) ...	5·80	— ·63	1·19	29	20	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis)	4·35	+ 1·59	·70	26	19	51·9	22	19·0	19	10	...
XVII.	Braemar ...	6·87	+ 2·93	·79	1	27	50·0	23	5·2	18	13	...
,,	Aberdeen (Cranford) ...	6·83	+ 3·36	·88	26	23	50·0	1, 2	18·0	18	15	...
,,	Cawdor (Budgate) ...	3·71	+ 1·06	1·06	26	21	...	...	...	...	...	...
XVIII.	Invergarry ...	6·22	+ ·24	1·15	21	14	...	...	...	...	...	...
,,	Bendamph ...	8·07	— 1·72	2·02	22	23	...	...	...	...	...	...
XIX.	Dunrobin Castle ...	4·01	+ ·75	·63	27	26	53·5	23	26·5	29	8	...
,,	Castletown ...	5·00	...	·68	11	27	48·0	2, 22	25·0	18	7	10
XX.	Killarney ...	5·57	— ·28	·85	23	24	58·0	5	22·0	18	...	...
,,	Waterford (Brook Lodge)...	4·38	+ ·47	·79	12	21	54·0	3	22·0	19	13	...
,,	Broadford (Hurdlestown) ...	2·95	— ·24	·49	29	22	52·0	12	21·0	18	13	...
XXI.	Carlow (Browne's Hill) ...	3·34	+ ·20	·48	4	18	...	...	...	...	...	...
,,	Dublin (Fitz William Square)	3·55	+ ·95	·68	1	19	55·9	22	23·6	19	6	14
XXII.	Ballinasloe ...	2·50	— 1·10	·45	25	22	...	...	...	...	...	...
,,	Clifden (Kylemore House)..	7·12	— 1·13	1·55	25	22	...	...	...	...	...	...
XXIII.	Seaforde ...	5·04	+ 1·10	1·57	10	22	51·0	11	27·0	17, 18	10	13
,,	Londonderry (Creggan Res.)	4·85	+ ·66	·91	26	27	...	...	...	...	...	...
,,	Omagh (Edenfel) ...	3·86	+ ·33	·60	25	21	52·0	22	20·0	17	10	14

+ Shows that the fall was above the average; — that it was below it. *a* and 26.

SUPPLEMENTARY RAINFALL, NOVEMBER, 1905.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	4·94	XI.	New Radnor, Ednol	4·49
,,	Ramsgate, West Cliff	2·57	,,	Rhayader, Nantgwillt	5·88
,,	Hailsham	5·68	,,	Lake Vyrnwy	5·63
,,	Crowborough	6·10	,,	Ruthin, Plâs Drâw	4·66
,,	Osborne	4·66	,,	Criccieth, Talarvor	4·88
,,	Emsworth, Redlands	4·00	,,	Anglesey, Lligwy	5·43
,,	Alton, Ashdell	4·25	,,	Douglas, Woodville	4·88
,,	Newbury, Welford Park	4·72	XII.	Stoneykirk, Ardwell House	4·91
III.	Harrow Weald	2·80	,,	Dalry, Old Garroch	8·26
,,	Oxford, Magdalen College	2·57	,,	Langholm, Drove Road	5·09
,,	Banbury, Bloxham Grove	3·72	,,	Moniaive, Maxwelton House	5·39
,,	Pitsford, Sedgebrook	2·74	XIII.	N. Esk Reservoir [Penicuick]	3·65
,,	Huntingdon, Brampton	1·95	XIV.	Maybole, Knockdon Farm	3·91
,,	Wisbech, Bank House	1·85	,,	Glasgow, Queen's Park	3·37
IV.	Southend	2·27	,,	Campbeltown, Redknowe	6·41
,,	Colchester, Lexden	1·90	XV.	Inveraray, Newtown	6·76
,,	Saffron Walden, Newport	2·55	,,	Ballachulish House	7·68
,,	Rendlesham Hall	2·05	,,	Islay, Eallabus	6·13
,,	Swaffham	2·31	XVI.	Dollar	6·37
,,	Blakeney	1·83	,,	Loch Leven Sluices	6·03
V.	Bishops Cannings	3·20	,,	Balquhidder, Stronvar	...
,,	Ashburton, Druid House	6·92	,,	Coupar Angus Station	5·07
,,	Okehampton, Oaklands	5·23	,,	Blair Atholl	3·80
,,	Hartland Abbey	5·32	,,	Montrose, Sunnyside	7·61
,,	Lynmouth, Rock House	4·34	XVII.	Alford, Lynturk Manse	8·03
,,	Probus, Lamellyn	5·59	,,	Keith	8·11
,,	Wellington, The Avenue	3·36	XVIII.	N. Uist, Lochmaddy	4·03
,,	North Cadbury Rectory	4·08	,,	Aviemore, Alvey Manse	3·33
VI.	Clifton, Pembroke Road	3·02	,,	Loch Ness, Drumnadrochit	4·41
,,	Moreton-in-Marsh, Longboro'	3·82	,,	Glencarron	7·85
,,	Ross, The Graig	3·69	,,	Fearn, Lower Pitkerrie	3·23
,,	Shifnal, Hatton Grange	2·38	XIX.	Invershin	5·36
,,	Wem Rectory	2·62	,,	Altnaharra	5·45
,,	Cheadle, The Heath House	3·78	,,	Bettyhill	4·06
,,	Coventry, Kingswood	2·89	,,	Watten	4·01
VII.	Market Overton	2·92	XX.	Cork	4·64
,,	Market Rasen	3·12	,,	Darrynane Abbey	5·90
,,	Bawtry, Hesley Hall	2·48	,,	Glenam [Clonmel]	4·31
VIII.	Neston, Hinderton	3·25	,,	Ballingarry, Gurteen	2·46
,,	Southport, Hesketh Park	4·77	,,	Miltown Malbay	3·53
,,	Chatburn, Middlewood	4·71	XXI.	Gorey, Courtown House	4·31
,,	Cartmel, Flookburgh	5·39	,,	Moynalty, Westland	3·49
IX.	Langsett Moor, Up. Midhope	6·59	,,	Athlone, Twyford	2·87
,,	Scalby, Silverdale	5·27	,,	Mullingar, Belvedere	3·41
,,	Ingleby Greenhow	7·20	XXII.	Woodlawn	2·93
,,	Middleton, Mickleton	3·85	,,	Westport, Murrisk Abbey	5·65
X.	Beltingham	3·36	,,	Crossmolina, Enniscoe	8·52
,,	Font Reservoir, Fallowlees	5·60	,,	Collooney, Markree Obsy	4·70
,,	Ilderton, Lilburn Cottage	6·01	XXIII.	Enniskillen, Portora	3·02
,,	Keswick, The Bank	6·13	,,	Warrenpoint	3·60
XI.	Llanfrechfa Grange	4·82	,,	Banbridge, Milltown	2·68
,,	Treherbert, Tyn-y-waun	8·11	,,	Belfast, Springfield	3·75
,,	Carmarthen, Friary	5·37	,,	Bushmills, Dundarave	4·37
,,	Castle Malgwyn	5·00	,,	Stewartstown	3·50
,,	Plynlimon	8·00	,,	Killybegs	4·96
,,	Tallyllyn	3·20	,,	Horn Head	4·51

METEOROLOGICAL NOTES ON NOVEMBER, 1905.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—The most prominent features of an ungenial month were the large amount of gloomy weather with frequent R, and the excessive humidity. There were a few clear cold days in the third week with two sharp frosts, but otherwise no two consecutive days without measurable precipitation. Duration of sunshine 33·5* hours, and of R 68·9 hours. Mean relative humidity 92·2 per cent. Mean temp. 41°·7, or 1°·3 below the average.

TENTERDEN.—A wet month except for the week of frost from 16th to 22nd. Windy on 11th, 23rd and from 26th to 28th. Duration of sunshine 66† hours.

CROWBOROUGH.—Notwithstanding the heavy and continuous R, the month was not unpleasant, having many bright sunny days and mild nights. The only dry days were from 16th to 21st, and the R was 2·44 in. above the average. Mean temp. 41°·3. Severe gale from the night of 25th to 10 p.m. on 26th.

HARTLEY WINTNEY.—Cold, dreary, foggy and wet, with several frosty nights. S.W. gale on 26th. Beautiful display of Aurora on 15th from 5.30 to 9 p.m. Mean amount of ozone 4·2.

PITSFORD.—A few days in the middle were fine and bright, but it was mostly wet and gloomy. R ·32 in. above the average. Mean temp. 39°·5.

COLCHESTER.—Damp and cold with several foggy mornings. Fine displays of Aurora Borealis at 6 p.m. and 8.15 p.m. on 15th.

BURY ST. EDMUNDS.—A month of usual November weather. No severe frost. R was insufficient to fill up ponds and wells.

BRUNDALL.—Mean temp. 41°·0, being 2°·8 below the average, and the lowest in November since 1896. Bright Aurora Borealis on the evening of 15th.

TORQUAY.—Mean temp. 44°·6, or 1°·8 below the average. Duration of sunshine 103·3* hours, or 36·0 hours above the average. Mean amount of ozone 4·2; max. 8·0 on 26th and 27th; min. 1·0 on 14th and 22nd.

WELLINGTON.—Rough and stormy, but with no very violent gales. R about ·25 in. above the average. Temp. generally low after 12th, especially about 18th.

NORTH CADBURY.—The wettest and windiest November in 10 years, and with two exceptions the coldest. There were three bar. depressions with readings below 29 in. A cold spell with some bright days occurred from 16th to 21st.

CLIFTON.—Mild and rainy till 14th, followed by a week of dry cold weather with N.E. wind and night frosts. From 22nd to 30th it was mild and rainy. R ·33 in. below the average.

ROSS.—Very cold till 22nd, especially in the third week, the mean temp. on 22nd being only 27°·2, and that for the whole month being 3°·0 below the average. The first 12 days were wet and R accompanied the gale of 26th. R about 25 per cent. above the average.

BOLTON.—The R was the greatest and the mean bar. the lowest on record. The first part of the month was mild with copious R and no frost. From 15th to 22nd was cold and dry, and from 23rd to the end the temp. was normal. Duration of sunshine 14·7* hours on 12 days, being 10·9 hours below the average. Mean temp. 40°·4, or 2°·5 below the average.

SOUTHPORT.—Characterized by abnormally low mean bar. and decidedly excessive R, but with remarkably light winds except on one day. Mean temp. 2°·9 below the average, owing to a brief period of excessive cold during the third week. Duration of sunshine 7* hours above the average. R 1·50 in. above the average.

UPPER MIDHOPE.—From 1st to 14th was very wet, followed by a spell of wintry weather from 15th to 21st, and again wet from 22nd to 30th, making the wettest November since 1888 except 1901.

LILBURN.—The weather was chiefly remarkable for excessive R and S storms. On 18th and 19th occurred the severest frosts ever remembered in November.

CARMARTHEN.—On the whole fine, the R falling mostly at night. From 15th to 21st the days were bright and fine with frost. There was a storm of considerable severity on the night of the 10th, when 1·02 in. of R fell.

HAVERFORDWEST.—Exceptionally cold, with large R which mostly fell in the night. The fall was the greatest since 1872. Duration of sunshine 76·7* hours. Bright Aurora on 15th.

GOGERDDAN.—Rather wet and damp, with low bar. but little fog. Stormy towards the end.

DOUGLAS.—The beginning and the end were very wet, with a brilliantly fine but cold period from 12th to 22nd with frost almost nightly. The weather on the whole was unusually quiet, although the bar. was low throughout. A N.W. gale of great violence occurred on 26th.

SCOTLAND.

LANGHOLM.—R ·21 in. below the average of 29 years.

INVERARAY.—Variable weather throughout. The Aurora Borealis on the evening of 15th was very beautiful.

MULL, QUINISH.—Very fine until 21st, but thereafter wet and unsettled, with sudden gales of great violence from nearly all points of the compass. Vivid Aurora Borealis on 16th [? 15th—].

COUPAR ANGUS.—Excessive R for the first time since March. The month was noteworthy for a long cold snap following 17th, and the mean temp. was about 2° below the average.

ABERDEEN.—Wet and cold with little sunshine. In upland districts crops were not yet got in and were in bad condition.

LYNTURK.—The month was notable for the excessive R, for the fall of 2·18 in. on 11th, and for the min. temp., 7°·2, on 17th.

DRUMNADROCHIT.—R 1·36 in. above, and rainy days equal to, the average of 19 years. The display of Aurora on the 15th was very fine; there had been hardly any Auroræ for years.

CASTLETOWN.—Cold and wet throughout. In farms where harvesting was rather late, the crops were still lying in the fields at the end. Corn and turnip crops were generally below the average and potatoes were badly diseased.

IRELAND.

CORK.—R ·58 in. above the average. Mean temp. 6°·3 below the average, being the lowest in 25 years. As usual it was a foggy month.

DARRYNANE ABBEY.—R 91 per cent. of the average. Strong gale from N.W. on 26th, but on the whole rather less wind than usual in November. Sharp frost from 15th to 19th.

DUBLIN.—Cold, foggy, damp and wet. Mean temp. 42°·7, or 2°·7 below the average. S on the ground on 18th and 19th. Bright Aurora on the evening of 15th.

BANBRIDGE.—R ·11 in. below the average of 40 years.

BELFAST.—Foggy weather prevailed, with frost at intervals. R slightly under the average.

OMAGH.—With the exception of a short sharp spell of night frost in the third week and again at the close, the weather was damp and dark. The small excess of R did nothing to redress the previous deficiency, and springs had not been so low in November for at least 44 years, probably much longer.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, June, 1905.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	81·9	22	46·2	7	71·3	53·0	53·9	79	129·9	44·7	4·39	17	6·9
Malta	93·9	30	59·9	3	81·0	64·7	64·5	79	138·5	55·3	·02	1	2·2
Lagos	88·0	15	69·0	13	83·1	73·7	74·6	85	141·0	62·5	25·59	25	8·1
Cape Town	70·8	2	40·9	1	60·7	48·7	50·2	81	...	...	13·29	19	5·6
Durban, Natal	79·9	18	45·4	14	72·4	53·8	...	...	132·0	...	11·12	5	3·9
Johannesburg	66·6	5	28·7	12	58·6	39·1	32·8	63	120·2	17·5	·00	0	1·7
Mauritius	78·7	9*a*	53·0	26	76·7	62·6	62·2	80	141·9	45·1	2·67	14	3·2
Calcutta	106·1	16	74·1	26	96·7	81·0	78·7	75	161·0	70·9	1·60	4	6·4
Bombay	93·9	20	76·6	26	91·3	82·0	77·0	75	144·5	74·8	6·53	15	5·5
Madras	108·2	2	77·2	17	102·4	82·1	71·8	62	149·8	76·0	·98	7	5·3
Kodaikanal	70·9	3	49·7	12	65·5	54·2	52·1	79	146·0	44·4	3·38	17	6·9
Colombo, Ceylon	88·2	15*b*	74·5	20	86·0	77·9	74·5	83	144·0	73·0	4·45	25	7·1
Hongkong	88·6	30	69·8	22	85·0	77·4	75·2	83	146·3	...	19·70	20	8·0
Melbourne	62·2	8	37·4	16*c*	56·7	46·6	44·2	79	116·3	30·0	1·32	15	8·7
Adelaide	64·2	7, 21	40·9	13*d*	59·6	47·8	46·8	80	119·5	35·7	3·71	19	7·9
Coolgardie	70·0	7	34·2	18	61·5	42·1	40·1	65	137·0	24·2	·50	4	3·4
Sydney	68·1	22	40·7	25	61·1	47·8	43·2	77	105·1	31·9	2·19	20	3·8
Wellington	61·7	14	30·5	5	52·6	42·3	41·8	82	102·5	27·0	8·75	21	6·6
Auckland	62·0	14	37·0	5	58·5	47·9	47·3	81	115·0	31·0	6·00	23	6·0
Jamaica, Negril Point	90·2	23	68·7	7	86·2	73·2	72·9	77	...	...	4·22	7	...
Trinidad	89·0	8, 23	69·0	1*e*	86·9	70·8	72·0	78	165·0	63·0	6·01	12	...
Grenada	86·2	16	71·8	3	83·6	74·7	71·5	79	145·0	...	6·64	25	4·3
Toronto	85·2	20	39·9	1	73·4	53·7	55·5	76	...	33·6	3·19	14	5·9
Fredericton	88·7	16	31·2	7	68·7	45·7	45·5	59	...	...	2·43	8	6·4
Winnipeg	84·5	12	35·0	10*f*	69·3	47·6	...	...	...	...	4·62	15	5·9
Victoria, B.C.	68·7	17	47·3	14	62·8	50·5	...	...	...	...	1·06	8	5·6
Dawson	85·7	24	32·6	11	70·4	48·0	...	...	...	...	·25	2	4·4

a and 12, 19, 20. *b* and 16, 17. *c* and 27. *d* and 20. *e* and 17, 26. *f* and 21.

MALTA.—Mean temp. of air 71°·6. Mean temp. of sea 73°·8. Mean hourly velocity of wind 7·1 or 1·6 below average. T8S on 4th.

Capetown.—The rainfall is the greatest ever registered here in one month, the previous record being 11·41 in. in June, 1892.

Durban.—In 24 hours, ending 3 p.m. on 1st, 11·00 in. R fell.

Mauritius.—Mean temp. of air 0°·2, dew point 1°·1, and rainfall ·61 in. above, averages. Mean hourly velocity of wind 8·4 miles, or 2·8 below average.

KODAIKANAL.—Bright sunshine 132 hours. Mean daily wind velocity 398 miles.

COLOMBO.—Mean temp. of air 81°·2 or 0°·1 above, of dew point 0°·3 above, and R 3·72 in. below averages. Mean hourly velocity of wind 11·2 miles.

HONGKONG.—Mean temp. of air 81°·1. Mean direction of wind E.S.E. and mean hourly velocity 11·4 miles. Bright sunshine 144·3 hours.

Adelaide.—Mean temp. of air 0°·3 above, R ·78 in. above, averages. Most cloudy June on record; sunshine 77 hours, or 45 below average.

Sydney.—Mean temp. of air 0°·1 above, and R 3·23 in. below, averages.

Wellington.—Mean temp. of air 2°·4 below, and R 3·77 in. above, averages.